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AND

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NOTES ON THE LIFE-HISTORY AND STRUCTURE OF BLEPHAROCERA CAPITATA LOEW.

BY VERNON L. KELLOGG,

Stanford University, California.

I.

In the swift, tumbling little stream of Coy Glen, which has cut its way from the summit of West Hill into the valley at the head of Cayuga Lake, near Ithaca, N. Y., an interesting fly makes itself abundantly at home. This fly is *Blepharocera capitata* Loew, one of the few North American species of its family. In Comstock's Manual there is a picture of the larva and of the pupa of this fly. The midge itself looks like a small crane-fly. Prof. Comstock gives in the Manual some account of the *Blepharocera's* interesting habits and transformations. The larva and pupa are strangely modified to adapt themselves to their aquatic life, for both larva and pupa live submerged, clinging to the rockbed of the stream. They gather in groups, forming black patches on the bed, in the swift shallow parts of the brook. The larvæ hold firmly to

the smooth rock by means of six "suckers" lying in a single segmented series in the median line on the ventral aspect of the body. So fast-holding are these suckers that in attempting to remove a larva one often tears it in halves. Yet the suckers can be readily voluntarily loosened by the insect.

These strange larvæ of *Blepharocera* have not gone unnoticed in other lands. Fritz Muller found them in Brazil (and this was the discovery of the young stages of the Blepharoceridæ); Dewitz, another German naturalist, found them in the Hartz Mountains, and Prof. Zschokke, of the University of Basel, has sent me some specimens from Switzerland. Here in California I have found the midges of a new species of the genus *Liponeura*, belonging to this family, and shall some day find the larvæ. Of course, these various Blepharocerid larvæ represent several species, but all of the members of the family so far known have very similar immature stages.

For a year or more I have devoted some time to the study of the post-embryonal development of *Blepharocera capitata*, hoping to find in the development of a Nematocerous fly some new light on those remarkable phenomena of histolysis and histogenesis which accompany the development of the Diptera, but which have been chiefly studied in the case of *Calliphora*, one of the highly specialized members of the order. The results of this study will be published elsewhere, but a brief account of some of the interesting structural peculiarities of *Blepharocera*, in its various stages, together with the little that is known of its life-history, may be of interest to the readers of THE NEWS.

Life History.

The eggs of *Blepharocera capitata* have not as yet been found. The larvæ and pupæ have long been known to Prof. Comstock and his students, being abundant in two streams near Ithaca and not uncommon in others. On May 9, 1898, I visited Coy Glen and found many young larvæ; no eggs, no pupæ, no adults. The smallest of these larvæ were 2.5 mm. long, and the larvæ were much scattered over the smooth rock bed of the stream, where the water was swift, but shallow. The larvæ can only live in swiftly flowing water; they die soon after being removed into vials of water or into still-water

aquaria. On May 14th I found larvæ of all sizes, from 3 mm. to 10 mm. long, and also a few just formed pupæ. The larger larvæ, 9 to 10 mm. long, which were full grown and ready to pupate, had gathered together, forming conspicuous "patches" on the rock bed. Each of these patches contained from one to several hundred individuals.

Most of these full-grown larvæ were curiously covered dorsally with a close growth of diatoms. The most abundant diatom in this growth was one of the stalked *Gomphonema*. The basis of this covering of the larva's back was the gelatinous mass at the base of the stalked diatoms. Scattered upon and through this mass were individuals of *Nitzschia* and several other diatomaceous genera. The covering had a soft, felt-like appearance, grayish or brownish, and did not seem to trouble the larva. In fact in the light of this condition it was very interesting to me to discover that the principal part of the contents of the alimentary canal of the larva was composed of diatoms. Is there any connection between the food habits of the larva and this convenient flourishing of diatoms on the insect's back?

On May 17th there were many new pupæ, but also still many larva and these of all sizes, from the 2½ mm. fellows to the full-grown ones. The pupæ all lie with head down stream. On May 20th the pupæ far outnumbered the larvæ, and on May 26th the larvæ were scarce. There were no patches remaining; the larvæ were of various sizes. No adults had issued; this is certain from the fact that there were no empty pupal cases to be seen in the patches of pupæ. (The pupal skin always remains attached to the rock after the imago issues.) On June 1st I found the midges issuing. A few were seen flying, with slow, weak flight, over the stream, and I collected a number as they issued from the pupal skins. Prof. Comstock first observed, and described in the Manual, this interesting escape of the delicate fly from the submerged pupal skin. The swift water makes this matter a difficult one, and a majority of the flies whose issuance I watched were carried off before they could get above the water. By June 9th most of the imagines had issued, although there were still pupæ and even some larvæ there, mostly old. Farther up the stream

some larva of about middle size, i. e. about 5-6 mm., were found. I could find but few of the midges. These were clinging to the under sides of leaves of bushes bordering the stream, or were slowly flying about. I saw a female catch a small fly and eat it. Saw none *in copulo* or ovipositing.

Between June 9th and July 1st I visited the stream often, searching for the eggs, but in vain. The imagines were very scarce. I could find but one or two during an hour's searching. There were no larvæ nor pupæ left.

Some reference to the food habits of the imagines will be made in connection with the account of the mouth parts. But I have little else to tell about the life-history. The rest of the story is yet to be learned.

Anatomical Notes.

The larva. The curious shape of the larva is well shown by the illustration (fig. 508) in Comstock's Manual. But Prof. Comstock is in error in explaining the character of the segmentation of the body. The body (see Fig. 1, A) consists of six parts, separated by distinct constrictions. By making sagittal longitudinal sections through the body it can be seen that the anterior, apparently single, segment is composed of the fused head and three thoracic segments,

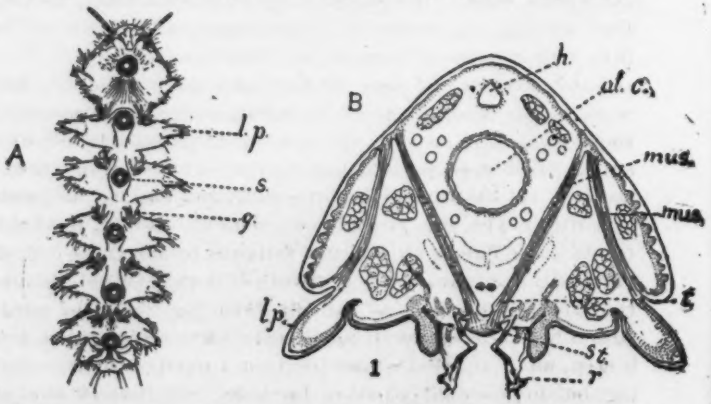

FIG. 1. *Blephrocera capitata* Loew; A, larva, ventral aspect; B, dorso-ventral section of body of larva through a sucker; *l. p.*, lateral projection; *s.*, sucker; *g.*, tracheal gills; *h.*, heart; *al. c.*, alimentary canal; *mus.*, muscle; *t.*, tendon; *st.*, "stopper" or sucker; *r.*, rim of sucker.

while the most posterior part is composed of the last two abdominal segments, the intervening parts representing each a single abdominal segment. That the anterior body parts comprises the head and thoracic segments is also proved by the fact that all the imaginal discs of the legs and wings are to be found here. The larva is footless, but each body part (not body segment) bears a pair of small, unsegmented, pointed projections (Fig. 1, *l. p.*), situated on the ventral aspect of the lateral margins. This projection may be of slight use to the larva in locomotion, but, at best, only of slight use. The real organs of locomotion and of attachment to the rock bed of the stream are the six "suckers," one of which lies on the median ventral aspect of each body part (Fig. 1, *s*). There is but one sucker for the combined head and thorax, and but one for the last two abdominal segments. By means of these suckers the larva clings to the rock bed of the stream, despite the impact of the swiftly flowing water. The larva can loosen its hold with the suckers voluntarily; and, by loosening those at one end of the body, swinging this end laterally and refastening it, and then loosening the other end of the body and swinging and refastening it, a slow but safe locomotion, chiefly lateral, is possible. The larvæ move about not a little, especially from the necessity of continually moving from the edge out farther into the stream as the water of the little stream gradually lessens in quantity.

The structure of these suckers and the manner of their working are of interest. The ventral (external) aspect of a sucker (Fig. 1, *s.*) shows a central opening, surrounded by a strong, flexible, concave rim, marked with alternating concentric bands of thicker and darker and thinner and lighter bands of chitin. The rim projects considerably ventrad, so that a considerable free or air space is enclosed by the rim when its outer edge is applied to any surface. In dorso-ventrad sections transversal to the body of the larva (see Fig. 1, *b.*) the whole structure of the sucker is apparent. The cup-shaped sucker is seen, after all, not to consist of a rim around a circular opening, but to be simply a part of the outer body wall (true skin and chitin cuticula) peculiarly folded and modified to act as a sucker. The projecting cup-like part (Fig. 1, *r.*) of the sucker

is coated with chitin, so as to be thick and strong, although still flexible. At its base the skin is almost free from chitin, thrown into fine folds, and bent in toward the interior of the body and then out again. Here it is greatly thickened by a circular, lens-shaped deposit of chitin (Fig. 1, *st.*), which is slightly larger than the inner neck of the sucker, which it closes internally. The neck of the sucker is the apparent central opening and the lens-shaped thickening is the bell-shaped structure, which closes this opening internally, as seen in looking at the sucker from the under or external side. The structure of the sucker is all plainly shown in Fig. 1, B, and can be much more readily understood from an inspection of the figure than from reading this description. Attached to the inner face of the lens-shaped "stopper" of the sucker are two great muscles (Fig. 1, *mus.*), which run dorsally and somewhat diagonally clear through the body cavity to the dorsal walls, to which they are attached. The muscles do not rise directly from the "stopper," but are fastened to it by strong, short tendons (Fig. 1, *t.*). The manner of the sucker's functioning can now be understood. With the rim resting on a smooth surface, the rock bed of the stream, and the "stopper" well down in the neck of the air cavity of the sucker, the lifting muscles may be contracted, the "stopper" raised (the folds at the neck give chance for a considerable movement of the "stopper") and a partial vacuum formed with the sucker. What muscles are used when the insect desires to loosen the hold of a sucker is not so evident. Probably the contraction of certain dorso-ventral muscles which lie lateral of the muscles which lift the "stopper" serves to force the "stopper" down by flattening the body dorso-ventrally. So firmly can the larvæ hold to the rock-bed by means of these suckers that one often tears a larva in two in attempting to remove it.

The larvæ breathe by means of small tufts of short, thick, cylindrical, tracheal gills (Fig. 1, *g.*). There is a pair of these gill tufts on the ventral aspect of each of the first to fifth abdominal segments. Each tuft consists of five or six short branches springing from a common short basal stem. On the sixth (last) abdominal segment there is no tuft of slender, branching gills, as in the other segments; but there are two

pairs of much larger, thicker, finger-like processes, which may be tracheal gills of another kind.

II.

The Pupa. The peculiar shape of the pupa, with its flat ventral aspect and strongly convex, heavily chitinized dorsal wall is well shown in Prof. Comstock's illustration (Fig. 508, Manual of Insects). The pupa has a pair of dorsal, prothoracic tracheal gills, each one of these organs consisting of four small elliptical, erect plates (Fig 2, *g.*). The whole of the flat ventral aspect of the pupa is applied to the rock, and the pupal cuticula is thin and membraneous. The wings and legs are folded on this flat ventral aspect.

FIG. 2 *Blepharocera capitata* Loew; pupa, dorsal aspect; *g.*, tracheal gills.

In the interior of the pupal body occur the interesting phenomena associated with the histolysis of many of the larval tissues and organs and the histogenesis of the imaginal tissues, which are as yet imperfectly understood. More than thirty years ago Weissman published his account of the post embryonal development of *Musca* (*Calliphora*) *vomitoria*, in which he told of the great breaking down or disintegration undergone by certain larval organs and of the development of the imaginal wings and legs from small groups of cells called imaginal discs, which could be found in the larva at an early age. Since then a few men have restudied the development of *Calliphora*, and, in addition, more or less completely the development of a few other insects of complete metamorphosis, including a butterfly, a beetle, an *Encyrtus*, the little brown ant, and a few others. What has been found out is chiefly this, that in insects with complete metamorphosis many of the larval organs and tissues disintegrate during the pupal stage, while the corresponding imaginal organs develop from small scattered groups of primitive cells, which are not derived from the cells of the larval organs, but are distinct from them; some of them are, indeed, derived directly from

the embryo. These groups of indifferentiated cells are called imaginal discs or histoblasts. The legs and wings of the imago develop each from a single histoblast, which is simply originally an invaginated part of the embryonic skin. Among those tissues and organs of the larva which break down are most of the muscles, most of the alimentary canal, the salivary glands, much of the tracheary tissue, the fat body, etc. The reproductive organs, the nervous system and probably the heart of the larva do not break down, but pass over with simple modifications into the imaginal body. One of the most interesting things about these remarkable phenomena is the fact that in many insects—in *Calliphora*, for example—the breaking down of the larval tissues is accomplished by phagocytosis. That is, the tissues are attacked by certain cells of the blood tissue, which destroy the tissues by eating them; hence the name of the cells, phagocytes. But the disintegration can occur, and does in the case of certain insects, without the intervention of the phagocytes.

Now because the study among the Diptera of these phenomena of post embryonic development have been confined almost wholly to the specialized flies, the study of the post embryonic development of some Nematocerous form ought to be of special interest. But *Blepharocera*, although belonging to the generalized Nematocerous flies, and with an imago in really very generalized condition (see the account later of the mouth parts of the female), has such a highly modified larva that it shows a very specialized condition of post embryonic development. It is believed by some morphologists that phagocytes aid in the disintegration of the larval tissues only where the post embryonal development takes place in a very short time, as in the Muscidæ. But my preparations show that phagocytosis occurs conspicuously and on a large scale in the development of *Blepharocera*, and this development is not specially hurried, the pupal stage lasting probably about two weeks. I am inclined to believe, therefore, that a high specialization of the larva, with the more radical differences between the larval and imaginal organs necessitating a greater destruction of larval tissues and organs, is quite a sufficient cause for phagocytosis, as rapid development.

The course of this histolysis and histogenesis, whose finding out has been the chief object of my study of *Blepharocera*, is, however, too complex a subject for consideration in these brief notes.

The Imago. The imagines have the general seeming of small Tipulids (Fig. 3, A). The legs are very long and the bodies slender. The females are larger than the males, and have more robust abdomens. To two specially interesting points in the structure of the imagines I wish to call attention.

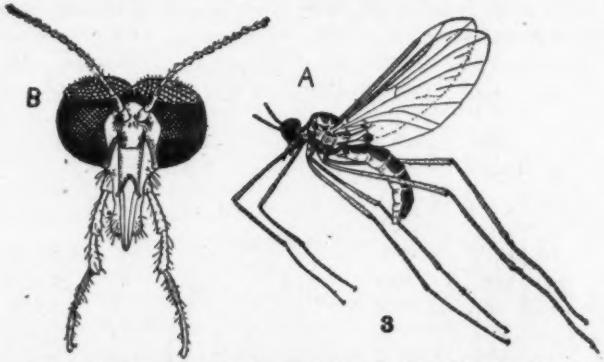

FIG. 3. *Blepharocera capilata* Loew; A, female; B, head of female, cephalic aspect.

In attempting to understand the specialized mouth parts of the sucking and piercing insects it is necessary for us to find the most generalized condition of the mouth parts existing in any of the groups of sucking insects whose mouth parts are to be studied. Among the Lepidoptera, for example, there exist in two or three small moths (*Eriocephala*, *Micropteryx*) mouth parts of such generalized condition that their parts can be readily and certainly homologized with the familiar, simple orthopterous biting type. Between these simplest, easily understood mouth parts of *Eriocephala* and the highly specialized mouth of the sphinx moth there exist all the gradations necessary to allow us to understand the course of specialization and the homologies of the extraordinary sphinx proboscis. Among the Hymenoptera a similar condition prevails, and the complex "tongue" of a honey bee is understood, and the

manner of its derivation is understood, because the generalized Hymenoptera, the saw-flies, have mouth parts sufficiently like the orthopterous type to make the homologies apparent, and because there are among the various Hymenopterous insects conditions of mouth parts gradatory from saw-fly to honey bee.

Now among the Diptera we search for the generalized mouth among the presumably generalized flies, the Nematocera.* And among all the Nematocera perhaps none has a mouth which is more generalized, i. e., more nearly in the condition of the typical biting mouth, than *Blepharocera*. The femal es of *Blepharocera*, like the females of *Simulium*, *Ceratopogon*, *Dixa*, *Culex* and some other Nematocera, are blood-sucking, and,

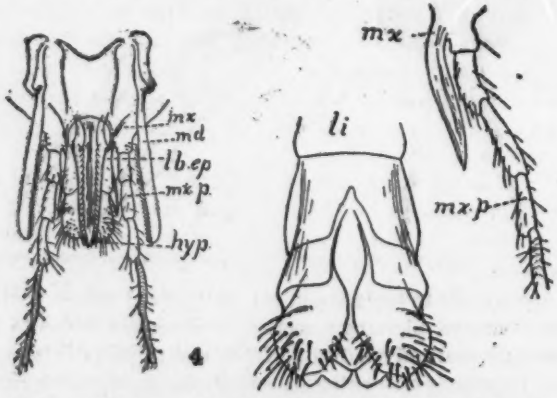

FIG 4. *Blepharocera capitata* Loew, mouth parts; *lb. ep.*, labrum epipharynx; *mx.*, maxilla; *mx. p.*, maxillary palpus; *md*, mandible; *hyp*, hypopharynx; *li*, labium.

while the mouth parts of these forms are not strictly biting, the mandibles are present, as cutting or sawing or piercing organs. The males of these forms are nectar-feeding and have lost the mandibles. In the mouth parts of the female *Blepharocera* all of the parts of the typical biting mouth are present, the mandibles, maxillæ and labium. The mandibles

* For an account of the mouth parts of all the Nematocerous families see Kellogg, "The Mouth parts of Nematocerous Diptera," Psyche, Vol. viii, Nos. 273, 275, 276, 277, 278.

(Fig-4, *md.*) are long and serrate on their inner edges, so as to be effective lacerating instruments. The maxillæ (Fig. 4, *mx.*) are elongate and blade-like and have four-segmented palpi. The labium (Fig. 4, *li.*) is, though somewhat elongated, truly tip-like and has its terminal lobes not coalesced and without pseudo-tracheæ. The hypopharynx is not short and tongue-like, as in the orthopterous mouth, but is long and slender, and stylet-like. Altogether the difference between the mouth parts of *Blepharocera* and the racial biting type is one of modification, and of modification not sufficient to obscure the homologies, although a modification more profound than that shown by the most generalized Lepidoptera or Hymenoptera. On the other hand, there is not much dfficulty in tracing the development of the Dipterous mouth from the generalized condition of *Blepharocera* (or *Simulium*, or *Dixa et al.*) to that extraordinary specialized condition shown by *Musca*, where the mandibles and maxillæ are lost and the labium is so modified that it has no longer any likeness to the "lower lips" of the orthopterous mouth.

The other specially interesting point in the imaginal anatomy of *Blepharocera* is the structural condition of the compound eyes. It has long been observed that several flies (*Simulium*, *Tabanas et al.*) and certain other insects (Libellulidæ, *Ascalaphus*, Ephemeridæ, *et al.*) have two sizes of facets in each compound eye; that some have the field containing these differently sized facets well delimited, the fields being in some cases actually separated from each other by a non-facetted line or by a constriction. When this constriction is so complete that the eye is truly divided we may fairly say that there are two pairs of compound eyes, the two eyes of each lateral pair differing in the size of the facets. This last extreme condition exists in the case of the males of certain Ephemeridæ and in both males and females of *Blepharocera capitata*.

The eyes of our *Blepharocera* are plainly divided, or are two on each side (Fig. 3, A and B). One of these eyes is dark colored, has small facets, and faces anteriorly and laterally. It is fairly convex. The other is reddish-brown, is composed of much larger facets, faces dorsally and has a nearly flat surface. This red, large faceted dorsal eye has the appearance of

flattened mushroom head, or thick plate, resting above the other eye. In the males the dorsal, large faceted eye is much smaller and less conspicuous than in the female, but both parts of the eye (or botheyes) are plainl y present. This difference in the two parts of the eye is more radical, however, than can be discovered by a mere examination from without. The ommatidia or eye elements of each of the regions differ, as shown by sections (see Fig. 5), in many particulars. Corresponding with the difference in size of the facets (the corneal lenses of the ommatidia) there is a marked difference in the diameter of the ommatidia from the two regions. The ommatidia of the dorsal large faceted eye are nearly twice as wide and they are tully twice as long as the ommatidia of the small faceted eye. Another striking and important difference is this, the larger ommatidia are very much less strongly pigmented than the smaller ommatidia. There are, also, some differences in the character of the inner optic "layers" lying between the hypodermal portion of the eye and the brain; characters too technical for discussion here. In sum, however, it is evident that there is so marked a difference in structure between the two eye regions that there must be a difference in function. The seeing by one of the eye regions differs from the seeing by the other eye region.

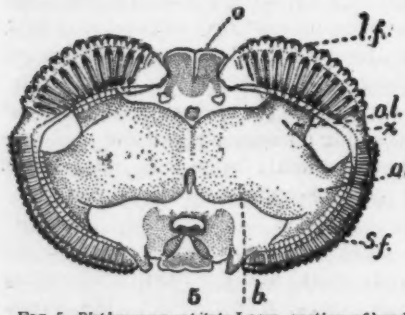

FIG. 5. *Blepharocera capitata* Loew, section of head through the eyes; *b.*, brain; *o.*, ocelli; *o. l.*, optic lobe; *l. f.*, large faceted eye; *s. f.*, small faceted eye; *i.*, unfaceted region between the two eyes of each side.

In a brief discussion elsewhere of the "divided eyes of arthropods"* I have referred to the observations of Chun,†

* Kellogg. "The Divided Eyes of Arthropods," Zoologisches Anzeiger, 1898, No. 557, pp, 280-281.

† Chun, Carl. "Atlantis, Biologische Studien uber pelagische Organismen," in Bibliotheca Zoologica, 1896, Bd. 7, Heft 19.

who has described the structure of the divided eyes of certain pelagic crustaceans, and to the observation of Zimmer,‡ who has studied the divided eyes of certain male May flies. In both of these cases the eyes show two sizes of facets, and accompanying this are both those other structural differences which are apparent in *Blepharocera*, viz.: the large ommatidia and small amount of pigment of the large faceted eyes as compared with the small ommatidia and heavy pigmenting of the small faceted eyes. Here are three groups of arthropods, certain crustaceans, May flies and flies, widely separated genetically and of widely varying habits, showing a common structural modification of the eyes. We have evidently to do with independent adaptations determined by some common functional need.

The large size of the ommatidia and the small amount of pigment are characters which adapt the large facted eyes for seeing in poor light (in the dark) and for readily perceiving moving objects (delicate perception of shadows).* The normal small faceted eyes see more accurately the actual shape of visible objects; they have better definition, but require much light. Chun explains that the large faceted eyes of the pelagic crustacea enable them to perceive their prey (for the crustacea possessing these eyes are all predaceous) in the poorly lighted levels of the water. The large facetcd eyes of the male May flies enable them, according to Zimmer's explanation, to perceive the advancing female during the twilight marriage flights peculiar to these forms. What is the special use of the large faceted eyes in the case of *Blepharocera*?

The females are predaceous; they capture other smaller live insects, and, lacerating them with the saw-edged mandibles and blade-like maxillæ, lap their blood. The males, on the other hand, presumably, do not capture insects; they have no mandibles and are probably nectar-feeding. The females might advantageously be possessed of a number of those large, weakly pigmented eye elements which are specially adapted

‡ Zimmer, Carl, "Die Facettenaguen der Ephemeriden," Zeitsch. f. wiss. Zoologie, 1898, Bd. 63, pp. 236–262, pl. xii-xiii.

* To present the proof of this statement, which is well based on the researches of Exner and others, would require a technical discussion which space and the character of this paper forbids.

to the quick perception of moving objects. But what makes this explanation less convincing is the fact that the males also possess these large faceted ommatidia, although, to be sure, in fewer number. Perhaps both males and females are active at twilight. Search as carefully as I might I could never find but very few of the adult *Blepharocera* along the stream, from which they were certainly issuing by thousands. Until the habits of our fly is better known, then, it is hardly profitable to speculate on the special use of its large faceted eyes.

In closing I wish to call attention to three other accounts of the life-history and structure of Blepharoceridæ, one being a paper (in Russian, which I have not seen) by Wierzeijskii;* another a description of the larva and pupa of *Liponeura brevirostris*, the specimen being found near Goslar, in the Hartz Mountains, Germany; the other a detailed account (in Portuguese) of the structure of the larva, pupa and imago of *Paltostoma torrentium*, found in the province of Santa Catharina, Brazil.† In this last account Dr. Muller claims that the females are dimorphic, one kind of female having divided eyes, mandibles and long tarsal claws; and, being blood-sucking in habit, while the other kind lacks the dorsal large faceted eyes and mandibles, has short tarsal claws and is nectar-sucking in habit. Baron Osten Sacken has not been able to satisfy himself that Muller is correct in his claim of dimorphism, despite the fact that Muller's reiterations are very emphatic. With this question of dimorphism in mind I have examined all of the females of *Blepharocera capitata* which I have collected, twenty-three in number. All these females agree in possessing dorsal large faceted eyes and mandibles, and agree in all other structural characters. There is no dimorphism among these specimens. Now almost all of the specimens were taken just at the moment of issuance from the pupal case in different parts of the stream at different times. The criticism that one kind of female may have habits rendering it more easily discovered and captured than the other kind, and, hence, that my few specimens include only the easily taken ones, is not valid in this case. I have, beside, dissected or sectioned many pupæ, and, in the case of all females thus examined, the mandibles were present. It seems probable to me that there is no dimorphism among the females of *Blepharocera capitata* Löw.

* Dewitz, H. "Beschreibung der Larve u. Puppe von Liponeura, brevirostris Löw," Berliner Ent. Zeitsch., vol. xxv, 1880, pp. 61-66, pl. 1v.

† Muller, Fritz. "A Metamorphose de um Insecto Diptero,' Archivos do Museu Nacional do Rio Janeiro, 1881, vol. iv, pp. 47-85 pl. 1v-vii.

ADDITIONAL LIST OF INSECTS TAKEN IN ALPINE REGION OF MOUNT WASHINGTON.

By ANNIE TRUMBULL SLOSSON.

I give herewith the names of some 170 species of insects taken in the summer of 1899, and not included in my former lists. I visited Mount Washington the last of June and remained thirteen days. Again in August I spent eleven days there. For identifications I am indebted to Messrs. Ashmead, Coquillett, Liebeck, Fox, Van Duzee, Fernald, Banks, Blanchard and Uhler.

PROCTOTRYPIDÆ.

Chelogynus slossonæ *Ashm.* MS.
Helorus paradoxus *Prov.*
Pantoclis washingtonensis *Ashm.* MS.
Pantoclis crassicornis *Ashm.*
Zelotypa fuscicornis *Ashm.*
Prosacantha tarsata *Ashm.* MS.
Prosacantha argentispilis *Ashm.* MS.
Galesus quebecensis *Prov.*

CYNIPIDÆ.

Allotria brassicæ *Ashm.*
Ceroptres ficus *Fitch.*

CHALCIDIDÆ.

Perilampus platygaster *Say.*
Chalcis tarsalis *Ashm.*
Chiloneurus albicornis *How.*
Chiropachys color *Linn.*
Miscogaster alticola n. sp., *Ashm.*
Omphale livida *Ashm.*
Dibrachys boucheanus *Ratzb.*
Euderus elongatus *Ashm.*
Tetrastichus basinotatus *Ashm.*
Eulophus alticola *Ashm.* MS.

EVANIIDÆ.

Aulacus rufitarsis *Cr.*

ICHNEUMONIDÆ.

Ichneumon seminiger *Cr.*
Ichneumon versabilis *Cr.*
Amblyteles ormenus *Cr.*
Phæogenes vincibilis *Cr.*
Bathymetis tegularis n. sp. *Ashm.*
Mesophron monticola *Ashm.* MS.
Phædroctonus coxalis *Ashm.* MS.

Diachasma mellea *Ashm.* MS.
Mesostenus candidus *Cr.*
Pimpla indigatrix *Walsh,*
Ecthrus luctuosus *Prov.*
Ecthrus abdominalis *Cr.*
Polysphincta tricolor *Ashm.* n. sp.
Ctenochira leucozonata *Ashm.*
Polyblastus pedalis *Cr.*
Ctenacme monticola *Ashm.* MS.
Cosmocomus americanus *Ashm.* MS.
Syrphoctonus bilineatus *Ashm.* n. sp.
Pyracmon sp.
Chorinæus costalis *Davis.*
Exolytus grandis *Ashm.*
Anomalon relictum *Fab.*
Temelucha scutellata *Ashm.*
Thersilochus provancheri *Ashm.*

BRACONIDÆ.

Aphidius montivagus *Ashm.* MS.
Hormiogaster slossonæ *Ashm.* MS.
Chelonus carinatus *Prov.*
Rhogas aciculatus *Cr.*
Microdus annulipes *Cr.*

POMPILIDÆ.

Ceropales fraterna *Sm.*

CRABRONIDÆ.

Crabro 6-maculatus *Say.*
Crabro nigrifrous *Cr.*

VESPIDÆ,

Vespa diabolica *Sauss.*

ANDRENIDÆ.

Halictus similis *Sm.*
Agapostemon æruginosus *Sm.*

DIPTERA

Mycetophila obscura *Walk.*
Mycetophila punctata *Meig.*
Culex pungens *Wied.*
Dicranomyia globithorax *O. S.*
Erioptera chrysocoma *O. S.*
Trichocera sp.
Pachyrrhina eucera *Lw.*
Tipula trivittata *Say.*
Rhyphus punctatus.
Odontomyia cincta *Oliv.*
Tabanus cinctus *Fab.*
Holcocephala abdominalis *Say.*

Rhamphomyia mutabilis *Lw.*
Platypalpus apicalis *Lw.*
Platypalpus lateralis *Lw.*
Ardoptera irrorata *Fall.*
Neoplasta scapularis *Lw.*
Chilosia lasiophthalma *Will.*
Pyrophæna ocymi *Fab.*
Temnostoma æquale *Lw.*
Corops sylvosus *Will.*
Oncomyia loraria *Lw,*
Actia palloris *Coq.*
Zelia vertębrata *Say.*
Pegomyia n. sp.?
Lispa hispida *Walk.*
Cœnosia nudiseta *Stein.*
Cordylura n. sp. ?
Allophyla lævis *Lw.*
Calobata antennipes *Say.*
Trypeta bella *Lw.*
Palloptera jucunda ? *Lw;*
Sapromyza n. sp.
Prochyliza chrysostoma.
Hydrina opposita *Lw.*
Drosophila funebris *Fab.*
Drosophila inversa *Walk.*
Drosophila quinaria *Lw.*
Hippelates flavipes *Lw.*
Hippelates pusio *Lw.*
Chlorops proxima *Say.*
Agromyza jucunda v. d. w.
Agromyza melanopyga *Lw.*
* Gymnophora arcuata *Meig.*
Phora picta *Lehm.*

COLEOPTERA.

Carabidæ.

Calosoma scrutator *Fab.*
Elaphrus clairville *Kirby.*
Patrobus septentrionis *Dej.*
Amara erratica *Sturm.*
Platynus reflexus *Lec.*
Harpalus pennsylvanicus *De G.*

Dytiscidæ.

Cœlambus impressopunctatus *Sch.*
Agabus punctulatus *Aube.*

Staphylinidæ.

Philonthus lomatus *Er.*

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* Not before recorded from this country."—Coquillett.

Philonthus brunneus? *Grav.*
Conosoma knoxii *Lec.*
Homalium lapponicum *Zett.*

ENDOMYCHIDÆ.

Endomychus biguttatus *Say.*

CUCUJIDÆ.

Laemophlæus adustus *Lec.*

NITIDULIDÆ.

Epuræa sp.

DASYLLIDÆ.

Cyphon ruficollis *Say.*

ELATERIDÆ.

Dolopius lateralis *Esch.*
Limonius aurifer *Lec.*
Œstodes tenuicollis *Rand.*
Sericosomus honestus *Rand.*

LAMPYRIDÆ.

Plateros canaliculatus *Say.*
Podabrus lævicollis *Kirby.*
Telephorus rectus *Welsh.*

PTINIDÆ.

Anobium notatum *Say.*
Xyletinus lugubris *Lec.*

CERAMBYCIDÆ.

Leptura proxima *Say.*

CHRYSOMELIDÆ.

Longitarsus turbatus *Horn.*

CURCULIONIDÆ.

Thysanocnemis fraxini *Lec.*
Rhinoncus pyrrhopus *Lec.*

SCOLYTIDÆ.

Hypothenemus sp.
Hylurgops pinifex *Fitch.*

ANTHRIBIDÆ,

Cratoparis lunatus *Fab.*

LEPIDOPTERA.

HETEROCERA.

Actias luna *Linn.*
Edema albifrons *S. and A.*
Benta asperatella *Clem.*
Crambus agitatellus *Clem.*
Platyptilia marginidactyla *Fitch.*
Tortrix conflictana *Walk.*
Steganoptycha crispana *Clem.*

Argyresthia gœdertella *Linn.*
Buccalatrix canadensisella *Cham.*

HEMIPTERA.

HETEROPTERA.

Podisus cynicus *Say.*
Podisus serieventris *Uhl.*
Banasa calva *Say.*
Acanthosoma cruciata *Say.*
Corizus novæboracensis *Sign.*
Nysius thymi *Wolff.*
Cymus sp.
Lygus n. sp.
Lygus *var.* flavomaculatus *Prov.*
Lygus monachus *Uhl.*
Lygus hirticœlus *Uhl.*
Inacora malina *Uhl.*
Largidea opaca *Uhl*, MS.
Neoborus saxeus *Dist.* var.
Agalliastes associatus *Uhl.*
Agalliastes n. sp.
Plagiognathus fraternus *Uhl.*
Phytocoris n. sp.
Cyrtorrhinus n. sp.
Psallus n. sp.

NEUROPTERA.

Chloroperla montana *Bks.*
Centroptilum luteolum *Muell.*
Chrysopa ypsilon *Fitch.*
Hemerobius stigmaterus *Fitch.*
Hemerobius venusta *Bks.*

ARANEIDÆ.

ARACHNIDÆ.

Epeira carbonaria *Koch.*
Cornicularia communis *Hentz.*

SOME NOTES AND DESCRIPTIONS OF SEVEN NEW SPECIES AND ONE NEW GENUS OF DIPTERA.

By CHARLES W. JOHNSON.

The new species here described are some that have been discovered in preparing the list of Diptera for Prof. John B. Smith's list of the insects of New Jersey, now in press.

Cecidomyia oxycoccana Johnson,

Cecidomyia vaccinii J. B. Smith. Special Bull. K., N. J. Agri. Exp. Sta., pp. 31-37, figs. 16, 17, 18, 1890. Catl. Ins. N. J., 360, 1890. (not Osten Sacken, Monogr. Vol. I, p. 196, 1862).

Cecidomyia oxycoccana Johns. Ent. News, X., 80, 1899.

This species was well described and figured by Prof. Smith in his special bulletin on "The Insects Injuriously Affecting Cranberries." As the name is preoccupied, I herewith take the liberty of redescribing it from Prof. Smith's work under the above name.

"In color the female is recognizable at once by the deep red abdomen, the grayish upper side of thorax, sides more yellow and black head and eyes. The male is smaller than the female, of a more uniform yellowish gray and also with black eyes. The legs are very long and yellowish, covered with fine hairs. The antennæ of the male are long and very handsome, appearing like a string of beads, each bead set with long hairs in a circle around it. The antennæ of the female are much shorter, the joints oval and closely joined. The female is furnished with a long extensile ovipositor, by means of which she thrusts her eggs into the very heart of the young shoot, probably depositing them at the base of one of the minute leaves just forming. The imago is about one sixteenth of an inch in length, the wings expanding about one-eighth of an inch, covered with fine hair.

"The larva is a minute orange red or yellow grub, about .06 inch or a trifle more in length. When fully grown the larva spins a very thin and delicate pure white cocoon, in which it changes into a pupa, with all the members of the future fly distinctly traceable. The pupa wriggles out of the cocoon before the fly emerges and makes its way to the edge of the leaf by means of the little rough points with which the abdomen is set.

"There are at least four, and probably five, broods of this insect, ranging in time from the beginning of May to the middle or end of September, and requiring from larva to imago about thirteen days."

Infests the terminal buds of the cranberry and "Loose Strife" (*Lysimachia terrestris*) in the vicinity of Jamesburg and other sections of the State.

Teucholabis complexa Osten Sacken.

The larvæ of this species was found in considerable number under the bark of a decayed oak in the woods below Peermont (Avalon), on June 8th. They commenced pupating

about the 13th, the imagos continuing to emerge from the 22d to the 27th.

Sargus cæruleifrons, n. sp.

♂ ♀. Upper half of the front and the vertex bluish green, shining, about one-third narrower in the ♂ than in the ♀; lower half of the front yellow, with a prominent transverse ridge, the upper edge of which is pure white; this ridge occupies about the middle of the front; face and occiput black, facial orbits yellow, palpi whitish, antennæ yellow with black hairs, aristæ black, the first joint of the antennæ slightly longer than in most species. Dorsum of the thorax, the scutellum and metanotum green, in the male, blue, with a slight green shade; humeral callus and pleura yellow, sternum black. Abdomen bright blue in the ♀, blue black in the ♂, sparsely covered with whitish pile, that is, thicker on the sides and at the margin of the segments; ventor black, the anterior margins of the segments yellowish. Legs light yellow, terminal half of the posterior femora (on the upper side) and tibiæ and the three last joints of the tarsi dark brown Wings, brownish hyaline, stigma and veins dark brown. Length, ♂ 7mm., ♀ 8mm.

Two specimens were taken in coition along Dunnfield creek, Delaware Water Gap, N. J., July 12, 1898.

Therioplectes politus, n. sp.

♂ Face black, pile whitish, oral margins brownish, with white pile that is longer than that on the face, mouth parts brownish; front black, densely covered with a grayish pubescence. Antennæ reddish, with black hairs, upper edge of the third joint brown, tip black. Thorax and scutellum black, shining, with sparse black pile; two subdorsal stripes, formed by grayish bloom, extends from the anterior margin to the suture, antealar tubercle yellow, humeri and postalar tubercle brownish, pleuræ black, with long yellow pile, especially below the base of the wing and tegulæ. Abdomen; first three segments yellow, shining, translucent, with a broad dorsal stripe and lateral margins brown, the remainder of the segments shining black, narrowly margined posteriorly with yellow, anterior margin of the four segments on each side and an obsolete spot connected with the posterior margin also yellowish, pile sparse blackish, second and third ventral segments yellow, translucent, first and fourth brown, the others black, all except the first with a posterior band of whitish bloom. Wings hyaline, veins and the greater portion of the marginal and submarginal cells brown. Legs black, base of the anterior tibiæ and the tibiæ and tarsi of the middle and posterior legs brown. Length, 10mm.

One ♂, collected at Merchantville, June 28, 1899. Anxiously looking for more material, I have refrained until now in describing this interesting species.

Daulopogon terricola, n. sp.

♂ ♀. Head with a dense, grayish pubescence, in certain lights the middle of the front and a line across the vertex is dark brown mystax, and the hair on the lower part of the occiput white, the antennæ and mouth parts black. Thorax and scutellum covered with a thick, grey pubescence, with two dorsal and a dorso-pleural line of brown, pleuræ, also with a dense grayish pubescence. Abdomen black, with a thin, whitish pubescence, segments minutely punctate, with a narrow, shining posterior border, which in some specimens show a more or less brownish color, a lateral margin expanding toward the posterior angle of each segment, is of a light gray on a yellowish ground, ventor with grayish pubescence, hypopygium brownish. Wings, hyaline veins dark brown, halters yellow. Legs reddish brown, coxæ, front and usually the middle femora, except the tip black, pubescence and hair white, terminal joints of the tarsi more or less blackish, hairs and bristles on the tibæ and tarsi black. Length, 7mm.

Ocean County (Prof. J. B. Smith), Clementon, May 9th, 30th; Wenonah, May 14th; Riverton, May 29th. This species is quite common during the spring on the low, damp ground of southern New Jersey. I have seen it from no other locality.

Rivellia brevifasciata, n. sp.

♂ ♀. Lower half of the face shining black, upper half opaque, front brown. opaque, vertex with three shining black spots, the central one surrounding the ocelli, frontal and facial orbits silvery; occiputs black, antennæ reddish, tip of third joint dark brown, Thorax and abdomen a uniform dark green. Legs entirely light yellow. The four bands on the wings are obsolete or greatly abbreviated, the first and second costal cells are hyaline; the first band consists only of a spot in the marginal cell; the second and third bands do not extend beyond the fourth longitudinal vein; the fourth, or apical band, about the same as in *R. flavimana*, but not connected with the third along the costal margin. Length, 4mm.

This species is nearest related to *R. flavimana* Loew, from which it is at once separated by the obsolete bands and hyaline costal cells.

Atco, June 18, 1893. I have also two specimens from Dr. Garry deN. Hough, collected by Mr. G. R. Pilate at Tifton, Ga., June 6th.

Chætopsis apicalis, n. sp. Fig 1.

Resembles *C. ænea* Wied., except in the color of the wings, which in this species are yellowish, with a large brownish-black apical

spot, bordered by a subarcuate whitish band; in some specimens there is a slight brownish tinge along the inner edge of the white band toward the costa; in others the apical spot is broken into three parts, forming wide margins to the veins, with hyaline stripes in the middle of the cells. Length, 4 to 6mm. ♂ ♀.

Cape May, June 14th; Anglesea, July 16th; Sea Isle City, July 22d; also at Ormond, Fla. (Mrs. Slosson), and St. Augustine. This may possibly be only a variation of *C. ænea*, but in the large series before me I fail to find satisfactory intermediates. It seems to be confined to the sea coast and is quite common in and along the salt water marshes.

Sepsisoma, n. gen.

Body slender, resembling *Sepsis* in form. Front very broad, face but slightly projecting, occiput fully one-third the total length of the head. Ocelli not approximate, the two upper ones being on the posterior edge of the vertex, the other near the front, aristæ distinctly pubescent. Two prominent lateral *prothoracic* and two *mesothoracic* bristles, scutellum small with two bristles. Metathorax abruptly sloping. Abdomen subpedunculate. Legs slender, femora not thickened, *front and hind femora only*, with four or five small spines on the under side toward the tip. Wings similar to those of the genus *Stenomacra* Loew. It belongs to the section *Richardina*, family Ortalidæ.

Sepsisoma flavescens, n. sp. Fig. 2.

Head, thorax, abdomen, legs and antennæ reddish yellow, ocelli brownish black, third joint of the antennæ slightly more than double the length of the second and third together, oblong and tapering slightly toward the tip; vertex shining with four bristles, one on each side of the anterior ocelli, the others on the orbits, occiput also with four bristles, two on each side near the vertex. Thorax subopaque, halters light yellow. Abdomen somewhat darker toward the base, the whole covered with a short yellowish pile. Legs covered with short yellowish hairs, middle and posterior tibiæ and tarsi with a more or less brownish tinge. Wings hyaline, with a small brown spot at top, extending equally along the margin on each side of the end of the third longitudinal vein. Length, 6mm.

Three specimens, one of which was taken along Big Timber Creek, a short distance above Westville, August 19, 1897.

Neaspilota achillea, n. sp. Fig. 3.

Head light yellow, first and second joints of the antennæ also light yellow, third joint of a slightly darker shade. Thorax and scutellum light yellow, dorsal portion and the metathorax blackish with a whitish bloom and pubescence. Abdomen dark yellow, with blackish pile. Ovipositor shiny, legs yellow, wings as shown in figure, except that in some specimens there is only a wide costal margin, the short transverse stripe becoming obsolete or wanting Length, 4mm.

Common on the Yarrow or Milfoil (*Achillea millefolium*) at Avalon, June 30, 1895; one specimen, Edge Hill, Montgomery County, Pa., July 4th; also one specimen from Dr. Garry deN. Hough, collected by Mr. G. R. Pilate at Tifton, Ga., June 6, 1896. It resembles in general appearance a small *N. vernoniæ* Lw.

NOTES ON NORTH AMERICAN DIURNALS WITH SOME ADDITIONS AND CORRECTIONS TO DR. SKINNER'S CATALOGUE.

WILLIAM BARNES, M. D, Decatur, Illinois.

Heliconius charitonius Linn. This species, so common in Florida, is only rarely found in Texas and Arizona I have occasionally received specimens from near Kerrville, Texas, and from Cochise Co., Arizona.

Agraulis vanillæ Linn. Occasionally found as far north as Colorado.

Argynnis cybele Var. *carpenterii* Edw. The original types of this variety were taken on Taos Peak, northern New Mexico, and not in Arizona as is stated in both Edwards' and Skinner's catalogues. I have this year received specimens from near Durango, Southwest Colorado. *Cybele*, as it occurs with us in the East, I have never seen in the mountainous regions of Colorado, nor west of the continental divide. Typical *leto* occurs as far east as Utah, and possibly in the extreme western part of Colorado along the line. In the intermediate territory between where *leto* and *cybele* fly we find the forms of *carpenterii* and *charlotti*, the former more to the eastward, the latter west and north. *Charlotti* forms a very close connecting link between *leto* and *cybele*, and its occurrence in the intermediate territory is of interest as showing the path along which at some former time the species probably spread across the continent.

Argynnis oweni Edw. A long series of specimens of this species, some from Prof. Owen himself, others from Idaho, compared with the types, show such close gradations into *hippolyta* that in most cases it is impossible to tell under which name to place the specimens.

Argynnis rhodope Edw. Specimens taken in Yellowstone Park and Idaho are but a shade lighter on the under surface of the secondaries than typical specimens taken in British Columbia.

Argynnis behrensii Edw. Mendocino, California, is the only locality mentioned in Skinner's Catalogue for this species. It is, however, not at all rare at Glenwood Springs, Colorado, as has already been recorded by Mr. Edwards. I have also received it from Utah and Durango, Colorado.

Argynnis meadii Edw. This is one of the commonest species of Argynnis in the canons around Denver, Colorado. It is also found in Idaho and Wyoming in addition to the localities given by Skinner.

Melitæa nubigena Var. *wheeleri H.* Edw. Is found in Nevada, Utah and Western Colorado, while the variety *capella* Barnes is found around Denver and Manitou, Colorado.

Melitæa gillettii Barnes. Since the types were taken in Yellowstone Park, I have also received specimens from Idaho.

Melitæa rubicunda H. Edw. Is found in Oregon, as well as in Northern California.

Melitæa acastus Edw. Is common in Western Colorado.

Melitæa whitneyi Behr. Is found in Washington and Oregon as well as California and Nevada.

Melitæa alma Str. Examples from Durango, Colorado, do not differ from those taken in Utah and Arizona.

Melitæa nympha Edw. Is quite common in the Huachuca Mountains, Southern Arizona.

Melitæa arachne Edw. Is not rare around Kerrville, Texas.

Melitæa definita Aaron. Is common on the Nueces River, Southern Texas.

Eresia tulcis Bates (*punctata* Edw.) Common along the Lower Nueces River, Southern Texas.

Grapta satyrus Edw. Is not at all rare in Arizona.

Eunica tatila Herr Schaff. Must be extremely common around Miami, Florida, as I have received more than 500 specimens from there this season.

Heterochroa californica Butl. Is found in New Mexico and California in addition to the localities mentioned by Skinner. It is common in Southern Arizona.

Neonympha henshawi Edw. I have taken this species as far north as Denver, Colorado, but its home is in Arizona, in the southern part of which State it is very common. Like others of the genus its flight is rather slow and jerky, flitting under and through the

thorny bushes which form most of the vegetation in that delightful country. The rough, rocky nature of the land and the abundance of rattle snakes add additional charms to collecting. *Rubricata* is also found there, but is not so common as in Texas.

Cœnonympha haydenii Edw. Is very common in Hayden Valley, Yellowstone Park, and adjacent parts of Idaho. It flies out upon the open grassy plains and is very easy to capture. Along in the middle of July one can easily take a couple of hundred specimens in a day.

Erebia discoidalis Kirby. Skinner puts the habitat of this species as Boreal America, but it is common at least as far south as Calgary Alberta.

Erebia sofia Str. This species must be very local in its habits. It is found in Yellowstone Park, on the north side of the low hills where the grass and herbage is rank and green, and where the trees are few and so scattered as to permit the sun to shine in in broad patches. Its flight is regular and slow, and it does not wander far from home. When they are frightened they fly only a few feet and then drop down among the rank grass and crawl into the tangled herbage, where they remain motionless. It is very difficult, indeed, to find them and almost impossible to make them fly up again. The beautiful bright yellow spots change to a dirty yellowish white after death. They are not at all rare in Yellowstone Park about the middle of July, if one knows exactly where to look for them.

Gyrocheilus tritonia Edw. This species is found quite plentifully at an elevation from 4,000 to 6,000 feet in the mountains of Southern Arizona. It flies in the same sort of country as *henshawi*, and its capture is attended with the same difficulties.

Epinephele xicdque Reak. This beautiful Satyrid is not at all rare in the Huachuca Mountains of Southern Arizona, and adds a new genus as well as species to our list.

Satyrus paulus Edw. Is quite common in Colorado, both around Denver and Glenwood Springs.

Satyrus actus Bd. Idaho and Wyoming may be given as additional localities for this species.

Thecla crysalus Var. *Citima* H. Edw. Is common around Glenwood Springs, Colorado.

Thecla spinetorum Bd. Several specimens taken the past summer in the Huachuca Mountains, Southern Arizona, show a much greater range for this species than hitherto suspected.

Thecla leda Edw. Is quite common around Mesquite in May, in Southern Arizona.

Thecla apama Edw. Is very common in May and June in the mountains of Southern Arizona.

Thecla affinis Edw. I have only received this species from Utah, though specimens of Dumetorum from Colorado are often taken with only the slightest trace of the white spots.

Thecla sheridanii Edw. Is common early in the spring around Denver, Colorado, but is very local in its habits.

Chrysophanus editha Mead. Is found in Southern Oregon, California and Utah, giving it a much more extensive range than credited to it by Skinner.

In addition to localities given by Skinner, I have *mariposa* from Washington and Oregon; of *zeroe* from Utah, Wyoming and Idaho; of Florus from Idaho and Wyoming, and of *cupreus* from Beaver Cañon, Idaho. *Dorcus* is quite common at Port Arthur in July.

Lycæna glaucon Edw. Is much more common in Utah than in Colorado.

Archonias lyceas Godm. and Salvin. This species is occasionally found in Southern Arizona. Both Mr. Poling and myself have received examples from there the past season.

Anthocharis olympia Var. *rosa* Edw. Is quite common in the early spring around Denver, Colorado.

Gonepteryx clorinde Godt. Placed by Strecker on our list, but was omitted by Edwards and Skinner. Two quite fresh specimens taken this season in the Huachuca Mountains, Southern Arizona, prove that it is occasionally found north of the Mexican boundary.

Colias eurydice Bd. A specimen taken near Kerrville, Texas, gives a much more extensive range for this species than it has hitherto been credited with.

Colias meadii Edw. and *elis*, Str. A long series of specimens from Yellowstone Park, compared with typical *meadii* from Colorado, and *elis* from Laggan, show all gradations and would puzzle anyone to tell to which species they belong.

Colias emilia Edw. Is very common around Pullman, Washington, and at Osoyoos, British Columbia.

Pamphila taxiles Edw. Is common in Colorado around Denver, Manitou and Glenwood Springs. Also very common in Southern Arizona.

Pamphila siris Edw. Is extremely common at Taylor's Ranch, about half way between Beaver Cañon and Yellowstone Park.

Pamphila bellus Edw. A number of specimens of this species taken this year in the Huachucas Mountains, Arizona, are, I believe, the first taken since Morrison got the types many years ago.

Pamphila python Edw. Is not rare in the same mountains.

Pamphila lunus Edw. Seems to be much rarer than *deva*, which it so closely resembles, but a single specimen was obtained this season.

Pamphila phylace Edw. This species seems to be common around Las Vegas, New Mexico, and is occasionally taken around Denver, Colorado.

Amblyscirtes cassus Edw. and *nanno* Edw. Are both rather common in the Huachuca Mountains, Arizona.

Grais stigmaticus Mab. A single specimen of this large Hesperid

was taken near Kerrville, Texas, last season. It is rather worn and was probably driven by the wind from its natural home in Mexico

Eudamus idas Cram. I have specimens of this species from Kerrville, Texas, also from Southern Arizona and New Mexico, so that it probably deserves a place on our list.

Eudamus outis Skinner. Is not rare in Southern Arizona as well as Texas.

Eudamus coyote Skinner. A few specimens of this species were taken in the neighborhood of Corpus Christi, Texas.

Eudamus epigona Herr. Schaff. Is not at all rare in the Huachuca Mountains, Arizona.

Eudamus cellus Bd. Lec. Is very common in the same region, and *dorus*, Edw. is also found there, but much less plentifully.

Erycides amyntas Fab. Is extremely common at Miami, Florida, as several hundred specimens received from there this season testify. I also have the species from Texas and Arizona

Pyrrhopyga araxes Hew. This species is very common in the Huachuca Mountains in June and July.

Ægiale streckeri Skinner. Not rare around Durango, Colorado. Varies greatly in size and markings.

Ægiale neumoegenii Edw. This species is not rare in Southern Arizona, but seems to be local in its habits and to fly only during a short season. A series of fifty or more specimens show little variation.

A DESCRIPTION OF A VARIETY OF ARGYNNIS NITOCRIS FROM CHIHUAHUA, MEXICO.

By W. J. Holland, LL.D.

I recently received from C. H. Tyler Townsend a collection of Lepidoptera made by him in the State of Chihuahua, Mexico. The collection was taken at the head of the Rio Piedras Verdes, in Chihuahua, at an elevation of from 7,100 to 7,300 feet above sea level in the Sierra Madre region. The collection was quite devoid of novelties, consisting almost wholly of common species of wide distribution. The only exception to this observation is found in a varietal form of *Argynnis nitocris* Edwards, for which I propose the varietal name of *cærulescens*.

Argynnis nitocris, var., cœrulescens, var.

♂. The male does not materially differ from the types of *nitocris* contained in the Edwards collection, except that the basal and median area are darker on the upper side than in the type and the spots more confluent. On the under side the deep red of the basal

and posterior portion of the primaries is darker and more intense and the black spots broader.

♀. The female differs greatly in appearance from the typical female of *nitocris*, because of the fact that the quadrate limbal markings on the primaries and the secondaries are blue, of the same tint as the corresponding spots in *Argynnis diana*. The basal and median portions of the upper side of the wings are deep black, shot in certain lights with a violet lustre. On the under side the wings correspond to the type of Nitocris in the disposition of all the spots and markings, but the red of the primaries is darker. The secondaries in some specimens have the wing before the median band of silvery spots dark olive green, with the submarginal band of light quadrate spots pea green in color. In other specimens the inner area of the wing before the median band of silvery spots is deep maroon In all specimens examined by me the submarginal band of light spots is more or less tinged with green, never pale honey-yellow, as in the type.

There is considerable variation in the expanse of the specimens, but in no case do they depart in the matter of size from the types of *nitocris* which are before me.

This form appears to be not uncommon in the month of September in the locality from which the specimens came.

The superficial resemblance of the female of this species to the female of *diana*, because of the blue color of the light spots on the upper side of the wings, is at first sight quite striking and the variety is altogether one of the most beautiful in the genus.

Carnegie Museum, Pittsburg, December 13, 1899.

A NEW COCHILDIAN OF THE PALEARATIC GROUP.

By HARRISON G. DYER.

I have had in my collection for several years a species of *Tortricidia* from Iowa, which I could not place with any described species. Lately Mr. W. F. Fiske has sent me another from Durham, New Hampshire.

Tortricidia flaksana, n. sp.

Body and fore wings brownish, ocherous, glistening; hind wings brown black, the fringe lighter. Fore wings with two blackish transverse lines, as in *T. græfii*, *T. pallida* and *T. flexuosa*; the inner line, slightly beyond the middle of the wing is straight, sharply defined inwardly, a little diffuse outwardly and in the Iowa specimen continued as a dusky cloud half way to the termen; outer line curved from costa, where it joins the inner line, to in-

ternal margin before anal angle; in the New Hampshire specimen obsolete, represented by a just perceptible series of dots. Expanse, 14–15mm. Two males; U. S. Nat. Mus., type No. 4413.

This species is allied to *T. græfii* Pack., but is larger, the hind wings black and the inner line on fore wings straight, not curved. Reakirt's *Kronæa minuta* is unknown to me, as no specimens have been taken since Reakirt bred the types, and these, which were in Dr. Strecker's collection, are at present lost. The genus *Kronæa* will probably prove a synonym of either *Heterogenea* or *Tortricidia*. Reakirt says the palpi "slightly exceed the head" and the hind tibiæ have "three spurs." The first statement is indefinite, the second erroneous. If the palpi slightly exceed the *front* and the tibiæ have two spurs, the genus is *Hterogenea;* if the palpi slightly exceed the *vertex* and the hind tibiæ have *four* spurs, it is *Totricidia*. The latter seems more probable, yet the description of the larva as possessing "densely spined papulæ" strongly suggests the former. It is possible, therefore, that *T. fiskeana* is a maculate form of *Kronæa minuta*; but if so, the form deserves a name in any case.

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A NEW *Sphinx* for this locality called *Cocytius cluentius* was caught here in Chicago about October 6th by a friend of we butterfly hunters, Mr. Stupe, who told us about it and gave it to Mr. Paul Vollbrecht. This specimen measures a little over seven and one-half inches across the wings, and is quite a good specimen for a collection. The colors look fresh, as if not long after leaving the chrysalis, although it is rubbed a little on the body, probably on account of the struggle Mr. Stupe had in catching it, he not being familiar with cyanid bottles. This *Sphinx* is frequently seen in collections of Brazil in Lepidoptera, and has been caught as far north as Mexico and the West Indies. I happen to have a specimen in my collection from Mexico. No matter whether the wind or the railroad cars brought it such a distance from the south, it should be added to our list of U. S. Sphingidæ. I am not certain wether the name given me is correct, and I therefore describe the specimen. The general color of the wings and body is a dark brown. The forewings are shaded with dark zig-zag lines, similar to our *Sphinx carolina;* the under wings are almost transparent, with a broad dark rim; there is a yellow shade, almost a spot, where the wings start near the body. The body is dark brown with orange yellow spots on each side, similar to *carolina*.

A. TROSCHEL

NOTE—The description applies fairly well to *Cocytius* (*Sphinx*) *cluentius* Cram. or *C. duponchelii* Poey. Our largest specimen of the former measures about four and one-half inches, and of the latter five and one-half inches.

HENRY SKINNER.

ENTOMOLOGICAL NEWS.

[The Conductors of ENTOMOLOGICAL NEWS solicit and will thankfully receive items of news likely to interest its readers from any source. The author's name will be given in each case, for the information of cataloguers and bibliographers.]

To Contributors.—All contributions will be considered and passed upon at our earliest convenience, and, as far as may be, will be published according to date of reception. ENTOMOLOGICAL NEWS has reached a circulation, both in numbers and circumference, as to make it necessary to put "copy" into the hands of the printer for each number three weeks before date of issue. This should be remembered in sending special or important matter for a certain issue. Twenty-five "extras," without change in form, will be given free, when they are wanted; and this should be so stated on the MS., along with the number desired. The receipt of all papers will be acknowledged.—ED.

PHILADELPHIA, PA., JANUARY, 1900.

Another volume has rolled into the past, and we are prepared to go on with THE NEWS and make it better than ever. It is our purpose to increase the number of pages and thus give more matter of interest and be able to more rapidly put into print the many papers that we receive. We also hope to be able to give colored illustrations, in addition to the usual half-tones and line engravings. We will welcome more articles of a popular but instructive nature, as many of our readers are non-professional and care little for the dry details of systematic work, although articles of this latter class will not be ignored. While we will give our readers still more for their money, the price will be the same as it was when we only published sixteen pages a month. In 1890, when THE NEWS was commenced, we hardly thought it would grow to a forty-page journal, and we feel grateful to those who in the past ten years have given us their aid and encouragement.

DEPARTMENT OF ECONOMIC ENTOMOLOGY

Edited by Prof. JOHN B. SMITH, Sc. D., New Brunswick, N. J.

Papers for this department are solicited. They should be sent to the editor, Prof. John B. Smith, Sc. D., New Brunswick, N. J.

LIFE HISTORY OF A TICK.

The scantiness of the present knowledge of the life history and habits of the tick kind may render the following observations on the South African Bont Tick *Amblyomma hebræum* Koch of some interest to American students. Other species found at the Cape present a similar life history. and the same is doubtless true of some of the American species, as, for instance, the Lone Star Tick and the Dog Tick of the South, which Professor Morgan, of the Louisiana Experiment Station, states are to be found as nymphs and adults in pastures.

The mother Bont Tick deposits her eggs on or in the soil or in rubbish, by preference just beneath the surface in soft ground. The young tick ascends the nearest support, whether grass, bush, fence post or anything else, and there, in company with its kind, awaits the passing of an animal. It generally remains motionless, but a movement in its vicinity usually causes it to extend its fore legs and to vigorously claw the air; this admits of its securing a hold on an animal with little waste of energy. Once on and attached, little enlargement takes place until after the third day. Then rapid distention occurs, and in a day or two the tick lets go its hold and drops. The duration of this period on the host varied from five to eight days in the thousands of larvæ reared in the course of recent studies; the greatest number always fell on the sixth day. The reason for the variation is unknown, but is suspected to be connected with the difference in the flow of blood from different tissues.

The distended larva is very active until a place for concealment is found. Then it becomes sluggish and gradually dormant. After a period of variable length the skin ruptures across the front and the nymph stage begins. If the tick is kept continually in a temperature of ninety degrees or above, the change to the nymph is complete in sixteen days from the voluntary dropping. Under ordinary conditions of temperature, however, the period must be a long one; in the case of some of the ticks reared it exceeded eleven weeks. The nymph behaves much as did the larva, but, naturally, as it is separated from its brothers, it generally waits alone. In time it usually secures a host. Then, as before, there is little change in size

for a few days; rapid distention follows and it soon falls off voluntarily for the second time. The duration limits of this host period, as shown by the thousand or more individuals reared under observation, are four and one-quarter and eight days; as in the case of the larva, most of the "drops" occurred on the sixth day. The distended nymph roams about until a suitable hiding place is found, which, where possible, is in the cover of the soil or plant stems, and then it settles down to moult. Incubation at 100 to 103 degrees has, in the case of two large batches, indicated the minimum period from the drop to this moult to be twenty-four days. The maximum limit has not yet been determined, but exceeds eleven weeks at a temperature averaging 65 degrees.

The sex, which in the larval and nymphal stages appears indistinguishable, is clearly indicated by the colors, markings and other characters in the adult. So distinct are the markings and so thin the old skin, that the sexes may be separated two or three days before the moult actually takes place. In general appearance the adult is as different as can be from the earlier stages, and therefore, until these studies were made, it is not strange that the different stages of the species failed to be associated with one another.

After its second and final moult the tick again seeks its host, and in its quest it now does relatively much more traveling and less resting than as a larva or nymph. The male fastens to a beast without much hesitancy, but the female is very reluctant to attach herself except in front of or close by one of the opposite sex. Almost or quite invariably the female does the courting. She will not, however, take notice of a male prior to the latter's attaching himself, and neither will the male give her encouragement. For a number of days, the minimum of which appears to be four, the male continues unattractive, and although a female may come up and touch him with her fore legs she passes him by. Then an entire change takes place in his behavior, and on the approach of a female he is thrown into wild excitement. He brings his body at right angles with the skin of the animal and waves his eight legs frantically. His would-be-mate rushes up, is caught by the waving legs, and in a few seconds the pair is in close embrace, the limbs of each entwining the other. The female then proceeds to penetrate the skin of the host just in front of where her mate is attached. Sometimes several females dispute over one male; and in such a case the unlucky ones may settle down, even to half a dozen in number, around the pair.

A few days after mating in this manner the female begins to swell, at first slowly and then more rapidly; by about the fifth day she may be half distended. Full distention is generally attained on the seventh or eighth day and the tick then falls. Development may, however, be complete in six and one-half days, or may not be

until the ninth. A female which takes up her position alone develops little, and is almost sure to let go within a week and renew her search for an eligible male. An unmated male may also relax his hold and search for a mate, but this does not appear to be a common habit, and in such cases as it has been noticed the male settled down near a lone female and left her to change her position to effect the match he evidently desired. The duration of a male's life on the host has still to be determined, but many specimens now on cattle under observation have been attached already over five weeks. During its stay it may have several successive mates. Sometimes it turns or is pulled about so as to embrace a second before the first has fallen, and a third has been observed to closely follow a second.

The period which elapses between the dropping of the distended female and the beginning at oviposition has varied in instances observed from two to ten weeks. Oviposition has extended from three to nine weeks and incubation from eleven weeks to six months. Under ordinary conditions it is estimated that the entire round of life normally occupies at least a twelvemonth. Larval ticks hatched six months ago are still alive. The hungry nymphs have less vitality and few have survived thirteen weeks, although the majority not utilized in tracing the life history survived full three months. The waiting adult ticks seem to become exhausted in a shorter time, but those kept did not begin to die off until the tenth week. The different stages have been kept the periods mentioned, principally at the office or in living rooms. The vitality of all has no doubt been severely tested by frequent disturbances and by being carried on long train and cart journeys. The larvæ have been kept in a cork-stoppered bottle, the nymphs in a glass-topped jar, and the adults in glass-topped pasteboard boxes. No moisture or anything from which nourishment could be derived has been given them.

The larvæ when on the host naturally gorge themselves with blood, but many specimens reared evidenced by their cream or pink body color that they had drawn colorless fluids wholly or in part. When distended the larvæ measure 2mm. in length. The nymphs reared were very uniform in their color; when distended fully they measure 5mm. to 6mm. in length, but exceptional individuals drop when even less than 4mm. A critical examination may show sexual differences in this stage but a superficial one; all that has thus far been made shows none at all. The adults measure from 4mm. to 6mm. in length when they emerge from the nymphal skin. The male does not increase perceptibly in length or breadth during its stay on the host. The female generally increases to at least 20mm in length, and individuals measuring 25mm. long, 19mm. wide and 13mm. thick are not uncommon. These details are in-

cluded here merely to give one an idea of the size of this gigantic species.

Owing to the size of the tick there is no difficulty in observing the interesting process of oviposition. For this act a broad furrow forms under the depressed rostrum and the genital orifice, which normally is beneath the body, is thus brought to the front margin. The lips of the orifice extrude, act as an ovipositor, and carry the egg upward almost half way over the depressed rostrum. Meanwhile a pale colored, glandular organ, cleft for much of its length, protrudes from a cavity situated immediately beneath the fore margin of the shield. Gradually unfolding its glistening arms, this gland extends itself downward over the rostrum, grasps the egg and apparently envelopes it in slime, which it secretes. It then retracts, dragging the egg with it for a distance, but eventually leaving its charge resting on the rostrum. The latter organ with the palpi then comes into play, and rising together they push the egg forward and out of the way. The whole operation usually occupies from fifty-five to sixty-five seconds. The slightest touch causes a suspension of the work, and several hours generally elapse before it again begins. If repeatedly disturbed, as for instance by the daily removal of the eggs, the tick may cease laying altogether. By careful computation the egg complements of three ticks taken at random have been found to be, respectively, about 10,000, 13,400 and 17,600. It is presumed that the largest individuals lay as many as 20,000. The eggs adhere to one another and form an irregular mass in front of the body.

The adult male does not appear to draw blood but to live on serous matter. There is always some inflammation about the "bites" of all stages, and at least a slight suppuration occurs where the adults settle. Great sores sometimes form, and it is this result of tick attack more than the actual loss of blood that makes the tick problem so important in South Africa. Heifers on badly infested farms sometimes lose from one to all four teats before they calve, and there are stock farms on which a cow with a sound udder is exceptional. The transmission of several blood diseases is attributed to the agency of the species by the farmers, and in the course of studying the life history it was incidentally discovered that the farmers were perfectly correct as far as Red Water (Texas or Southern fever) was concerned. This malady was transmitted to a stabled cow located a thousand miles from where the original female ticks were obtained.

The Bont Tick in all stages attacks all kinds of stock farmed in South Africa, and that without apparent discrimination. Different classes of stock may be infested by the same tick in the different stages of its development. The tick does not do well where the hair is thick and long, or it would be nearer the truth to say that it is not

adapted to climbing through hair. Therefore few, particularly in the adult stage, are found away from the relatively bare places, and hence some classes of stock become far more infested than others. Animals in high condition are less subject to attack than those in poor condition, but an animal in the very pink of condition may become much infested. Some individual animals are far less susceptible than others, but "tick-proof" animals have not been observed. The less susceptible animals are probably found by as many ticks as the others, but for an unexplained reason or reasons the ticks do not take hold. In this connection it may be mentioned that most ticks get on and tumble off a number of times before securing a hold. Horses are made lame by infestation beneath the fetlock; sheep and goats by attack between the toes. Ostriches are able to reach almost all parts of their bodies to remove the tick, and so keep themselves relatively free, the whole surface considered. Larvæ, nymphs and adults have all fastened on to the writer, but not so freely as on to cattle. Oddly, the pubic regions appear to be most attractive to them. This apparent preference was at first thought to be due to the arrangement of the clothing, but latterly it has been learned that native children, clad in a single garment hanging from the shoulders, suffer the same experience.

CHARLES P. LOUNSBURY.

Cape Town, South Africa.

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Notes and News.

ENTOMOLOGICAL GLEANINGS FROM ALL QUARTERS OF THE GLOBE.

KINGBIRDS EATING DRAGONFLIES.—During July and August, 1899, at Cottage City, Martha's Vineyard, Mass., kingbirds were frequently observed to catch and eat a large species of dragonfly which occurred abundantly about the house and downs The captured insects were invariably carried to a convenient perch, usually a fence, on which they were held with the bird's feet, while the wings were stripped off and discarded, when the body was pulled to pieces and eaten. J. PERCY MOORE.

[The dragonfly referred to was *Epiæschna heros* Fabr.; the kingbird is, of course, the common *Tyrannus, tyrannus* L. This is the most definite observation yet recorded, to my knowledge, on this subject, J. L. Hersey, Can. Ent., April, 1873, p. 160, having merely recorded that dragonflies are a favorite food for kingbirds See also M. J. Elrod in THE NEWS for January, 1898, p. 9, at bottom — P. C. P.]

ENTOMOLOGICAL HONORS.—Dr. L. O. Howard, Professors John B. Smith, F. M. Webster and H. F. Wickham were unanimously elected honorary members of the Entomological Society of Ontario at its meeting of October 11 and 12, 1899.

In response to an invitation sent out by Mr. H. H. Newcomb, a number of gentlemen met at his office in the Puritan Building, 35 Court street, Boston, on the evening of Friday, November 24, 1899, to take steps toward the formation of an Entomological Club. Mr. Newcomb presided, and Mr. W. L. W. Field was appointed to fill the office of secretary-treasurer pending the regular election of officers. The selection of a name for the club was deferred to the next meeting. It was agreed that the organization should be as informal as possible, and that its chief purpose should be to furnish opportunities for social intercourse among local entomologists. It was voted to meet again in the same place on Friday, December 15th, at 7:00 p. m. Beside those already mentioned there were present Messrs. P. G. Bolster, E. B. Clapp, J. A. Field, A. P. Hall, W. F. Low, G. A. Smalley, L. W. Swett, C. O. Zerrahn.

We learn from Mr. Philip Nell, 1836 North Seventh street, Philadelphia, that he is printing pin labels for entomologists all over the United States and Canada. This greatly pleases us, as it marks a great advance in the study of entomology. The carelessness of the past in regard to lack of data is greatly to be deplored, and many specimens collected by our predecessors are worthless on this account. We advise all our readers, subscribers and friends who do not use these labels to immediately get a supply and properly label the pins of all their specimens and send a supply of labels along with any specimens they send in exchange to correspondents.

The British-Boer War—Mutilated in a Hotel.—November 19th.—The latest eccentricity of the enemy was the firing of three rounds from a howitzer at half past seven o'clock last evening. The second missile pierced the roof of the Royal Hotel. Mr. Stark, a naturalist, who was preparing a book on "The Entomology of Natal," was standing in the doorway. He was hurled into the street, both his legs being torn off. He said, "Look after my cat," and then died.—*Philadelphia Ledger, November 30th.*

[Mr. Stark was preparing a work on "The Ornithology of South Africa;" the first volume of which he had completed. The work is to form part of Slater's "Fauna of South Africa."—Eds.]

On Perennial Youth.—Fads and fancies, or other pleasures and occupations, may become out-of-date, grow old or lose their charms, but nature study never. It is to be enjoyed by the really young at eight, to the young at heart at eighty and upwards. Pleasant memories are stored in youth for a beautiful harvest in old age, increased steadily by yearly accumulations. The naturalist may number his years by many, but he is never old."—*Popular Science. September, 1899.*

The drawing for the cover was made by our good friend Mr. Browning, of Salt Lake City, Utah.

Entomological Literature.

COMPILED BY P. P. CALVERT.

Under the above head it is intended to mention papers received at the Academy of Natural Sciences of Philadelphia pertaining to the Entomology of the Americas (North and South). Articles irrelevant to American entomology will not be noted. Contributions to the anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded. The numbers in HEAVY-FACED TYPE refer to the journals, as numbered in the following list, in which the papers are published; * denotes that the paper in question contains descriptions of new North American forms. Titles of all articles in foreign languages are translated into English; usually such articles are written in the same language as the title of the journal containing them, but when such articles are in other languages than English, French, German or Italian, this fact is indicated in brackets.

4. The Canadian Entomologist, London, Ont. Nov., '99.—**5.** Psyche, Cambridge, Mass., Dec., '99.—**7.** Bulletin No. 20, new series, U. S. Department of Agriculture, Division of Entomology, Washington, '99.—**11.** The Annals and Magazine of Natural History, London, Nov., '99.—**15.** Biologia Centrali-Americana, pt. cl, London, Sept., '99.—**35.** Annales, Société Entomologique de Belgique, xliii, Brussels, '99.—**55.** Le Naturaliste, Paris, '99.—**60c.** Comunicaciones, Museo Nacional de Buenos Aires, ii, 4, Sept. 20, '99.—**74.** Naturwissenschaftliche Wochenschrift, Berlin, '99.—**81.** Biologisches Centralblatt, Erlangen, '99.—**82.** Centralblatt für Bakteriologie, Jena, '99.—**84.** Insekten Börse, Leipsic, '99.—**89.** Zoologische Jahrbücher, Abtheilung für Systematik, xii, Jena, Sept. 28, '99.—**119.** Archiv für Naturgeschichte, lxv, i, 3, Berlin, Oct, '99.

The General Subject.—Bachmetjew, P. On the temperature of insects according to observations in Bulgaria, figs., Zeitschrift für wissenschaftliche Zoologie, lxvi, 4, Leipsic, Oct. 20, '99.—Boas, J. E. V. Some remarks on the metamorphosis of insects, figs., 1 pl., **89.**—Comstock, J. H., and Needham, J. G. The wings of insects, v., American Naturalist, Boston, Nov., '99.—Felt, E. P. Memorial of life and entomologic work of Joseph Albert Lintner, Ph. D. [New York] State Entomologist, 1874-98. Bulletins, New York State Museum, v, 24, Albany, Oct., '99.—Id. Voluntary entomologic service in New York State, **7.**—Frühstorfer, H. Diary leaves [with remarks on American entomological collections], **84**, Nov. 9, 16, 23.—Henslow, G. The fertilization of flowers by insects and other agencies, Journal, Royal Horticultural Society, xxiii, 2, London, Nov. '99.—Korschelt, E., and Heider, K. Text-book of the Embryology of Invertebrates. Translated from the German by Matilda Bernard. Revised and edited with additional notes by Martin F. Woodward. Vol. III. Arachnida, Pentastomidæ, Pantapoda, Tardigrada, Onychophora, Myriopoda, Insecta. London: Swan, Sonnenschein & Co, Ltd. New York: The Macmillan Co. 1899. Pp. xii, 441. 194 figs.—Krüger, G. The London insect market, **84**, Nov. 9.—Oudemans, J. T. De Nederlandsche Insecten, Aflevering 12,

13. s'Gravenhage, Martinus Nijhoff, 1899. Pp. 529-588, figs., Diptera; pp. 589-596, Siphonaptera; pp 597-640, figs., pls xxviii-xxxii, Coleoptera Rec'd. Dec, '99.—Rousseau, E. On the histology of insects, ii. Spermatozoids and spermatogenesis, figs., **35**, No. 11, Nov. 27.

Economic Entomology.—Anon. Phylloxera in Spain, **55**, Nov. 1. —Burgess, A. F. A destructive tan-bark beetle, **7**.—Cao, G. On the passage of micro-organisms through the intestine of some insects, **82**, Oct. 28.—Celli, A., and Del Pino, G. Contribution to knowledge of malaria-epidemiology from the latest etiological standpoint, **82**, Nov. 7.—Felt, E. P. Notes of the year for New York, **7**.—Fletcher, J. Insect pests, remedial treatment. Evidence before the Select Standing Committee [of the Canadian Parliament] on Agriculture and Colonization. Printed by order of Parliament. Ottawa, S. E. Dawson, 1899.—Forbush, E. H. The destruction of hairy caterpillars by birds, **7**. —Id. Recent work against the gipsy moth, **7**.—Francis, M., and Connaway, J. W. Texas fever [and tick infestation], figs. Bulletin No. 53, Texas Agric. Exper. Stations, College Station, Brazos Co., Tex., Oct., '99.—Grassi, B. Observations on the report of the Second Malarial Expedition in Italy presided over by Prof. Koch, etc. Rendiconti, Accademia dei Lincei, Rome, Oct. 15, Nov. 5, '99.—Howard, L. O. A remedy for gadflies: Portschiuki's recent discovery in Russia, with some American observations, **7**.—Id. The present status of the caprifig experiments in California, **7**.—Howard, L. O., and Marlatt, C. L. The original home of the San José scale, **7**.—Johnson, W. G. The Emory fumigator: a new method for handling hydrocyanic acid gas in orchards, **7**.—Id. Miscellaneous entomological notes, **7**. —Id. The destructive pea louse, a new and important economic species of the genus *Nectarophora*, **7**.—Id. The stalk worm: a new enemy to young tobacco, **7**.—Kirkland, A. H. A probable remedy for the cranberry fireworm, **7**.—Id. An improvement in the manufacture of arsenate of lead, **7**.—Id. Proceedings of the Eleventh Annual Meeting of the Association of Economic Entomologists, Columbus, O., Aug. 18 and 19, '99, **7**.—Lebois, D. A roach-trap, La Nature, Paris, Nov. 25, '99.—Lounsbury, C. P. et al. Ants, spraying locusts with paraffine, aphids on peach trees, vine beetle, Agricultural Journal, Cape Town, Oct. 26, '99.— Marlatt, C. L. The laissez faire philosophy applied to the insect problem, **7**.—Id. Temperature control of scale insects, **7**. —Id. An account of *Aspidiotus ostreæformis*, figs., **7**.—Pitcaithley, A. Notes on the larch disease, Transactions and Proceedings, Perthshire Society of Natural Science, iii, pt. 1, Perth, '99. Plimmer, H. G., and Bradford, J. R. Preliminary notice on the morphology and distribution of the parasite found in tsetse fly disease, **82**, Oct, 28.—Quaintance, A. L. Some

important insect enemies of cucurbits, figs. Bulletin No. 45, State College of Agriculture and Mechanic Arts, Georgia Exper. Station, Experiment, Ga., Oct., '99.—Id. Some insects and fungi destructive to truck and garden crops, figs. Proceedings, Twenty-third Annual Meeting, Georgia State Horticultural Society, Augusta, Ga., '99.—Id. Some insects of the year in Georgia, 7.—Schweinfurth. On the cause of malaria, 74, Oct. 15.—Scott, W. M. Fatal temperature for some Coccids in Georgia, 7, Smith, J. B. Three common orchard scales, figs., Bulletin 140, New Jersey Agric. Experiment Station, New Brunswick, N. J., Oct. 31, '99.—Webster, F. M. Insectary and office methods 7.—Id. An interesting outbreak of chinch bugs in northern Ohio, 7.—Webster, F. M., and Mally, C. W. Insects of the year in Ohio, 7.—Wilcox, E. V. Abstracts of recent papers, Experiment Station Record, xi, 3, U. S. Dep't. of Agriculture, Washington, '99.

Arachnida.—Cambridge, F. O. P. Arachnida Araneidea, vol. ii, pp. 57-64,* 15.—Molliard, M. On the histological modifications produced in stems by the action of *Phytoptus*, Comptes Rendus, Academie des Sciences, Paris, Nov. 20, '99.—Simon, E. Results of a voyage to the Pacific (Schauinsland, 1896-'97), Arachnoids, 89.—Smith, F. P. An introduction to British spiders, figs., Science Gossip, London, Dec. '99.

Myriopoda.—Verhoeff, C. Contributions to knowledge of palaearctic Myriopods, iv: On the classification, phylogeny and comparative morphology of the Julidæ and on some other Diplopods, 4 pls, 119.

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DOINGS OF SOCIETIES.

At a meeting of the Entomological section of the Academy of Natural Sciences of Philadelphia, Mr. Fox reported the presentation by Mrs. Slosson of a specimen of *Mellinus bimaculatus*, taken at Franconia, N. H. It is a very rare species. Mr. Lancaster Thomas said that collecting at Cranberry, N. C., has been very poor this past season. There was but one-third the usual rainfall, which made it the dryest summer there for twenty years. The absence of *Terias jucunda* and *delia* was mentioned. Mr. Gerhard, who had spent a year collecting Lepidoptera in Bolivia for Mr. A. J. Weeks, Jr., of Boston, Mass., said he collected first at Mollendo on the coast, but took but few species. Thence he went to Arequipa, 108 miles inland. This place would be a desert except for irrigation. Collecting was done along the ditches and on the Alfalfa and a few additional species found. Puno at 12,000 feet was a dry place without much vegetation; about five species were found here. Other places at high altitudes were mentioned, but did not produce much. He then went to La Paz, the starting point to the interior, or more tropical part of the country. About five species of diurnals were found at La Paz. Chulumani (5,000 feet) was the next place visited, where he remained seven weeks on account of the difficulties of travel and the breaking out of the revolution. The foot of the valley was the best place to collect, but the roads were very poor and zigzag in character and quite steep. The rain greatly interfered with collecting, but were often intermittent in character and the sun would shine between the showers. In seven weeks 1,800 specimens were taken. Owing to the illness of the mules locomotion was difficult and walking compulsory. The Indian guide walked through the cold rains and snow in a state of nudity without apparent discomfort. The great beauty of the mountain scenery was graphically described. The hotels were poor and hardly worthy of the name and are called tambos. The rooms were cheerless and almost without furniture. By collecting locally better results were obtained than by trying to cover too much territory. The second journey was made to the tropical country, about three days,

journey from La Paz. The difficulty of obtaining pasture for the animals was mentioned, and thus stopping was made impossible except at tambos. Many specimens were obtained on animal excrement along the roads, the dense vegetation making other places inaccessible. A few miles would often make quite a difference in the species, and different Morphos were mentioned as being taken only three miles apart. A place called Choro was described as a good collecting ground. It was eleven days to Cochabamba from La Paz and three more to Choro. The region was disappointing, the ground dry and vegetation sparse. After twelve more miles an undulating, mountainous country was entered. After a time a place was reached where collecting was good and species found not taken on previous journeys Three weeks were spent at this place. Picking Papilios from moist places by means of the fingers was described. The difficulties and means of travel in this country were graphically dwelt on. Dr. Skinner exhibited specimens of *Colios philodice* and *eurytheme*, captured by Mr. Lancaster Thomas at Cranberry, N. C. A large series showed no differences except in color, and in some the color intergraded. The extreme probability of these two being forms of one species was mentioned. Mr. Thomas called attention to a pallid form which was white above and dark beneath. Mr. Laurent showed a sport of *Cicindela vulgaris* and also two of *C. repanda* The same gentleman exhibited . specimen of *Calopteryx maculata* with parts of the wings spotted. Dr. Calvert said that some specimens were irregularly marked and that the name came from the spotted character of the type

HENRY SKINNER, M. D., Recorder.

AT the November meeting of the Feldman Collecting Social, held at the residence of Mr. Frank Haimback, 1309 Allegheny Avenue, thirteen persons were present. Prof. J. B. Smith exhibited specimens of larvæ and cocoons of a large hymenopterous insect which captured and stored katydids. This fact led one observer to believe that these larvæ were an early stage of the katydid because of the numerous parts of that insect which were found in the cells of the larvæ. The larvæ were unidentified, but from its large size and from the imago's habit of preying on Orthoptera was supposed to be *Monedula carolina*. Discussed by Messrs. Johnson and Fox.

Mr. H. W. Wenzel showed an unidentified chrysalis, which while in the larval state had bored into a pine log and dug out a cell before pupating.

Prof. Smith stated that it is probably a species of moth of the genus *Acronycta*, several species of which have such habits.

Dr. H. Skinner stated that Mr. Lancaster Thomas had collected many specimens of *Colias philodice* on October 26th at Cranberry, N. C., which were all extremely dark. Mr. Thomas was of the opinion that *C. philodice* and *eurytheme* were but one species, and

in this view Dr. Skinner concurred. Specimens of both these species had been collected which show all intergrades of coloration.

Prof. Smith suggested that a study of the genitalia of these species should be made before asserting them to be the same.

Dr. Skinner agreed with Prof. Smith in this matter.

Prof. Smith spoke of the frequent difficulty of determining species from superficial characters. Although orange and yellow forms may be considered as one species, it is not at all certain that specific characteristics will not be found in the genitalia of the males of each form.

Mr. C. W. Johnson exhibited *Myrmicomyja myrmicodes* greatly resembling an ant, and a probable species of *Stenomacra* which he proposed to call *S. flavescens*.

Mr. H. Wenzel exhibited two specimens of *Elater militaris*, a rare insect in this locality. Also recorded in addition to the local list of Pselaphidæ *Eumicrus notschulskji*, only known heretofore from Florida.

The secretary called attention to the disproportionate number of females against males in a collection of Eumenidæ from Brazil.

Dr. Skinner spoke on the present tendency of scientific workers to specialization, which he defended.

Prof. Smith commended the entomological portion of the *Cambridge Natural History* by Dr. David Sharp and referred to the high quality of the illustrations. An American elementary work on insects published during the past year forms quite a contrast to the former, not only in ideas but in illustrations.

The meeting then adjourned to a collation prepared by our host. Mr. Haimbach, at which the social side of the gathering was much in evidence. WILLIAM J. FOX, Secretary.

A regular meeting of the Newark (N. J.) Entomological Society was held at Turn Hall Sunday, November 12th, Vice-President Kemp presiding and ten members present. Mr. Erb remarked that *Catocalæ* were rare during the past season, but added that he was very successful in rearing *Sphinx* larva, taken mostly on Long Island. Other members reported that collecting was poor last season. Mr. Weidt exhibited several specimens of the genus *Crocata*, which were bred from eggs laid August 17th (second brood). The first imago emerged November 1st and the last November 11th. Pupæ were kept in cellar since September. The specimens were two ♂, with a heavy black band on lower wing, one showing a tendency to break into spots. There was one ♀, with the same black band. This makes the third brood. The balance of pupæ will probably lay over until spring. Mr. Kemp reported taking a nearly full-grown larva of *Œdemasia badia* on bay (name of plant) in the middle of June. Imago emerged July 5th. A. J. WEIDT, Secretary.